

(12) UK Patent Application (19) GB (11) 2 215 242 (13) A

(43) Date of A publication 20.09.1989

(21) Application No 8804306.2

(22) Date of filing 24.02.1988

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Jobs S p A

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(51) INT CL⁴
B23Q 1/10, B25J 17/00

(52) UK CL (Edition J)
B3B BMPB
B8H HDV H560
F2Q Q7A3H
U1S S1678

(56) Documents cited
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EP 0041136 A

(58) Field of search
UK CL (Edition J) B3B BMB1 BMF BMPB, B8H HDV
INT CL⁴ B23B, B23Q, B25J

(54) A head for machine tools having devices for automatically taking up play

(57) The head comprises a fork (1) between the arms of which is mounted a support unit (2) supporting a chuck (3). The mechanism for transmitting motion to the unit (2) is accommodated within the fork (1) and includes an axially displaceable shaft (8) biased by a spring (11) and carrying pinions (9, 10) with opposite helical threads which engage gearwheels (12, 13) having pinions (14, 15) which simultaneously engage a gearwheel (16) integral with the shaft of the chuck support unit (2).

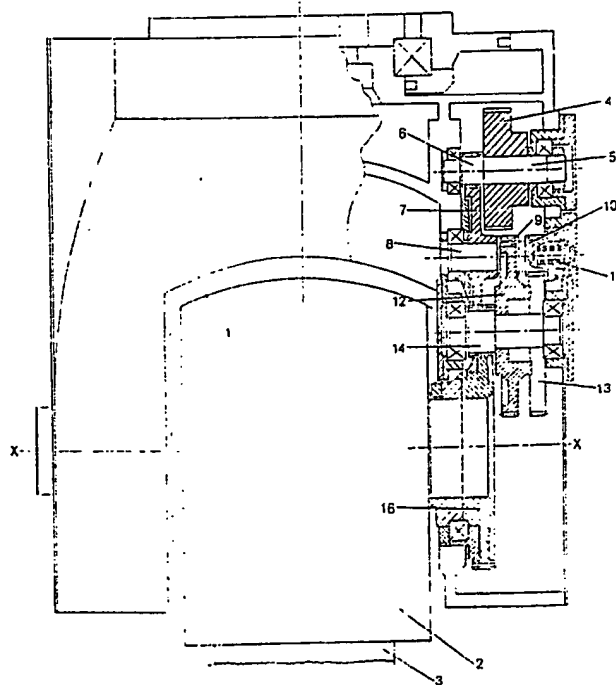


FIG. 2

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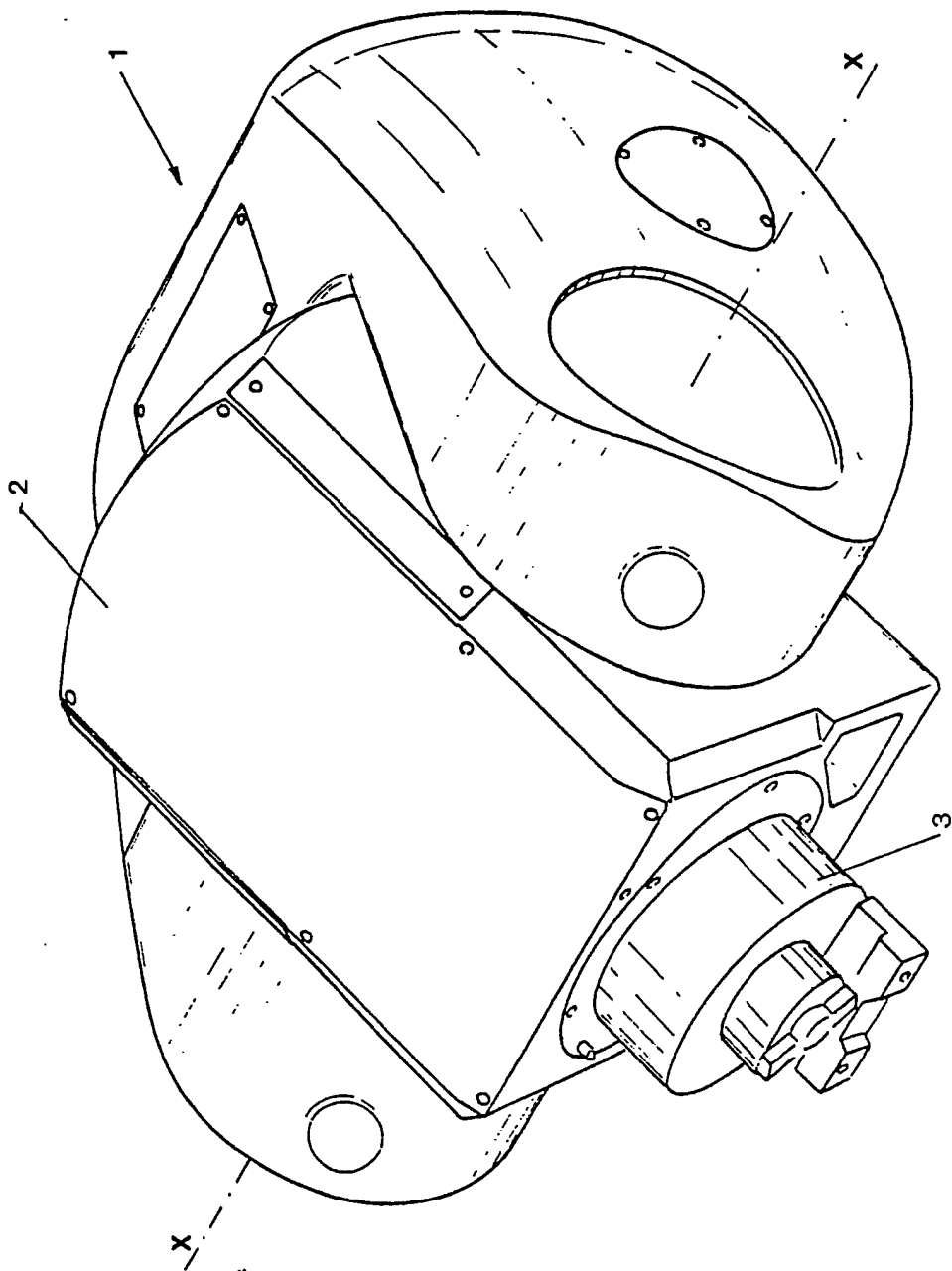


FIG. 1

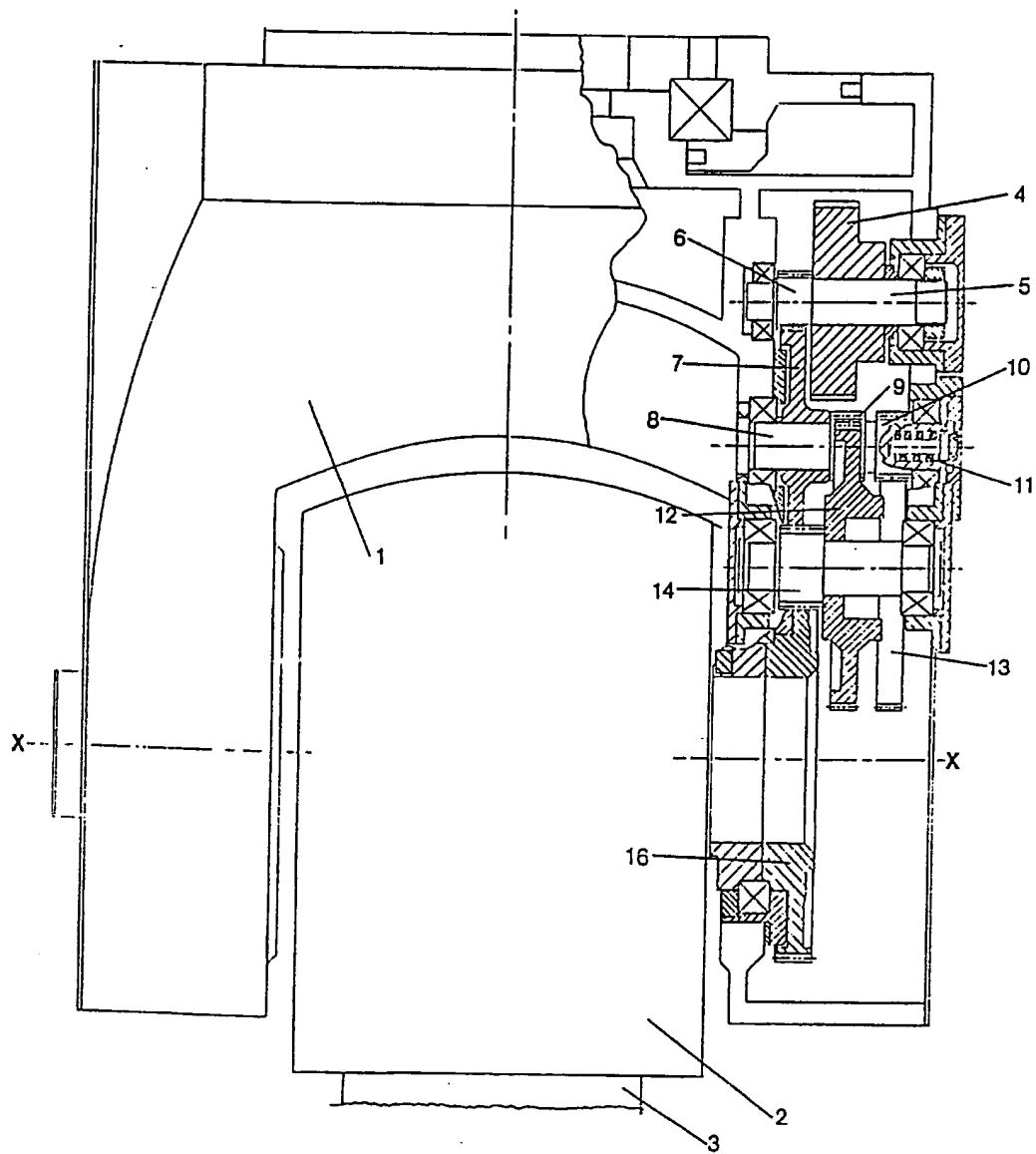


FIG. 2

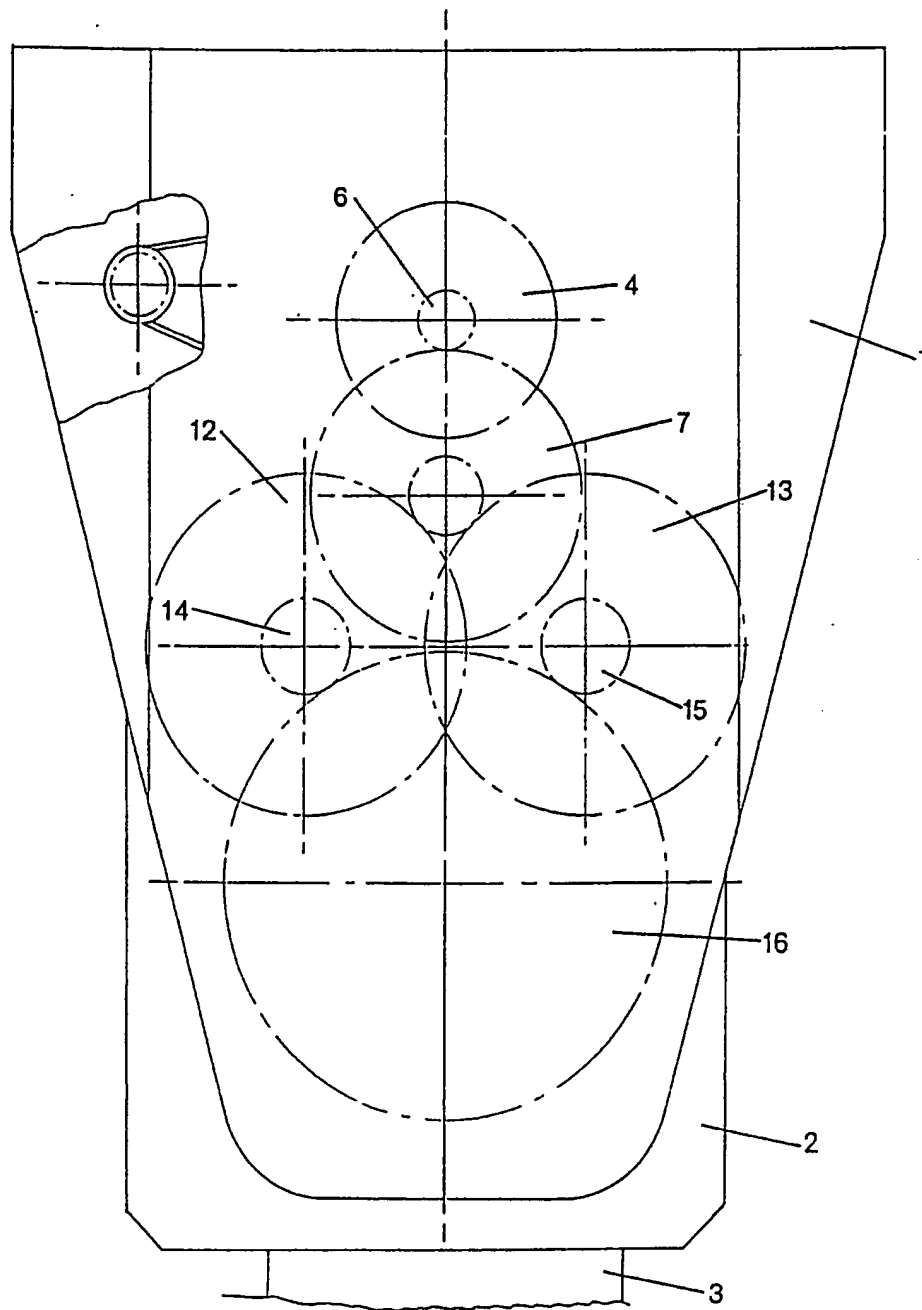


FIG. 3

A HEAD FOR MACHINE TOOLS HAVING DEVICES
FOR AUTOMATICALLY TAKING UP PLAY

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5 This invention proposes a head for machine tools
with devices for automatically taking up play.

10 More particularly it relates to a head for
automatic machine tools which comprises a fork mounted
on a support which can be moved about a plurality of
axes, between the arms of which is located a support
for a chuck mounted in such a way that it can rotate.

15 The mechanism effecting rotation of the said support
is of such a nature that it ensures that play is automatically
taken up as well as conferring greater rigidity upon the
whole.

20 With the development of industrial automation,
automatic machine tools, also known as robots, which are
capable of carrying out a sequence of even complex
operations in a completely automatic way and are capable
of serving a plurality of other machines on the basis of
repetitive cycles without the need for intervention by
25 the operator, are becoming increasingly widespread.

30 In this type of machine tools are mounted on a head
fixed at the end of a movable arm which has several degrees
of freedom.

35 One of the major problems encountered in the design
of this type of equipment is that of keeping dimensions
as small as possible in order that machining operations may
also be performed within workpieces without excessive
difficulty.

A head of the type mentioned above is described

in patent 2162936 B by the same applicant. This head has a special arrangement of ducts for the removal of dust whereby an extremely compact unit is obtained.

5 In this, as in other known heads, rotation of the chuck support is controlled by means of an endless screw, which engages a toothed quadrant which is integral with the shaft whereby the said support is mounted on the fork.

10 These known devices have however a number of disadvantages due in particular to the need to perform maintenance and/or adjustments at intervals in order to take up the play due to wear of the various components.

15 In order to overcome the above mentioned disadvantage this invention proposes a head for machine tools in which rotation of the chuck support occurs as the result of a mechanism through which play is
20 automatically taken up through the special conformation and arrangement of the parts.

 This arrangement also considerably increases the rigidity of the structure and provides increased
25 efficiency.

 The invention will now be described in detail with particular reference to the appended figures in which:

30 Figure 1 shows a perspective view of a head according to the invention;

 Figure 2 illustrates a head according to the
35 invention viewed from above in partial cross-section; and

Figure 3 shows a section along the line A-A in Figure 2.

5 The head according to the invention substantially comprises a fork 1 attached to a movable support, which is not illustrated as it is of a known type, between the arms of which a unit 2, supporting a chuck 3, is mounted.

10 Support 2 can rotate about axis X-X and this movement is controlled by a motor (not shown) placed within fork 1.

15 The mechanism which transmits the motion to support 2 is illustrated in Figures 2 and 3.

 The motion is transmitted to a pulley 4 mounted on a shaft 5 to which is keyed a pinion 6, which engages a gearwheel 7.

20 A pair of pinions 9 and 10 having opposing helical threads are mounted on shaft 8 of gearwheel 7.

25 Shaft 8, and with it pinions 9 and 10, may make limited axial displacements against the force exerted by a helical spring or the like 11.

30 Pinions 9 and 10 likewise engage gearwheels 12 and 13, to the shafts of which are keyed pinions 14 and 15, which both engage a gearwheel 16, which is integral with chuck support 2.

35 Movement, derived from the motor via pulley 4, pinion 6 and gearwheel 7, is transmitted to the pair of pinions 9 and 10, which have opposite helical gearing.

These cause gearwheels 12 and 13 to rotate respectively, which, in turn, rotates pinions 14 and 15. The latter two both engage gearwheel 16, which is integral with chuck support 2, which is thus caused to rotate.

5

The force exerted by spring 11 presses against shaft 8 on which pinions 9 and 10 are mounted, keeping the teeth of the latter pressed against the corresponding teeth of gearwheels 12 and 13 and thus automatically taking up any play which may occur as a result of wear of the parts.

10

For initial adjustment at the time of the assembly the securing devices of gearwheel 12 are removed and while pressing shaft 8 in such a way as to compress spring 11, the said gearwheel 12 is rotated until the teeth of pinions 9 and 10 engage the corresponding teeth of gearwheels 12 and 13.

15

At this point gearwheel 12 is secured on its own shaft and shaft 8 is released, spring 11 pressing it back axially to take up any play as described above.

20

The mechanism illustrated makes it possible to achieve other not insignificant advantages: above all a unit which has appreciably greater rigidity than known mechanisms is obtained, although the same dimensions are retained. High reduction ratios of the order of 1/300 may be obtained, appreciably increasing the efficiency of the device (which is close to 75% against the 35% of previous devices), and finally increasing the dynamic services of the system.

25

30

Obviously the dimensions and the materials used may be varied in accordance with operating requirements.

35

CLAIMS

1. A head for machine tools of the type comprising
a fork on which a chuck support is mounted, in which
5 a mechanism which automatically takes up play is
provided to control rotation of the said chuck support.
2. A head for machine tools according to claim 1,
in which the said mechanism comprises a shaft which
10 is capable of axial displacement against biasing
means, on which are mounted a pair of pinions with opposite
helical threads which engage similar gearwheels in turn
mounted on shafts to which are keyed pinions, which
simultaneously engage a further gearwheel integral with
15 the shaft of the said chuck support.
3. A head for machine tools substantially as herein
described with reference to the accompanying drawings.

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